4th International Conference on Electrical and Computer Engineering
ICECE 2006, 19-21 December 2006, Dhaka, Bangladesh

FUZZY FREQUENCY CONTROLLER FOR AN AGC FOR THE IMPROVEMENT OF POWER SYSTEM DYNAMICS

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ABSTRACT

A very important matter of discussion in power system operation is the oscillations damping problem. In this paper the authors propose a Fuzzy Frequency Controller (FFC) to improve the dynamic performance of a single-area power system. This paper represents the implementation of Fuzzy Frequency Controller for an AGC in single-area power system. The aim of the proposed controller is to restore the frequency to its nominal value in the smallest possible time whenever there is any change in the load demand etc. The controller provides a satisfactory balance between frequency overshoot and transient oscillations with zero steady-state error. It is found that the proposed controller exhibits satisfactorily well dynamic performance and overcome all possible drawbacks associated with conventional PI controller.

Keywords: Fuzzy Frequency Controller, AGC, Conventional PI Controller, Single-area power system.

1. INTRODUCTION

Power system stability issue has been studied widely. Many significant contributions have been made, not only in the aspects of analyzing and explaining the dynamic phenomena, but also in the efforts of improving the stability of transmission systems. Among these techniques, generator control is one of the most widely applied in the power industry. This typically includes load frequency control (or AGC) and excitation (AVR) control [1].

Many investigations in the area of automatic generation control (AGC) of isolated and of interconnected power systems have been reported in the past and a number of control strategies have been proposed to achieve improved performance[2, 4]. In the electric power generation, system disturbances caused by load fluctuation result in changes in the desired frequency value. Load Frequency Control (LFC), or automatic generation control, is a very important issue in power system operation and control for supplying sufficient and reliable electric power. The conventional control strategy for the LFC problem is to take the integral of control error as the control signal [3].The proportional integral (PJ) control approach is successful in achieving zero steady-state error in the frequency of the system, but it exhibits relatively poor dynamic performance as evidenced by large overshoot and transient frequency oscillations [2-4]. Moreover, the transient settling time is relatively large. In the application of optimal control techniques, the controller design is normally based on a fixed parameter model of the system derived by a linearization process. Also Power system parameters are a function of the operating point. Therefore, as the operating conditions changes, system performance with controllers designed for a specific operating point most likely will not be satisfactory [5]. Consequently, the nonlinear nature of the load frequency control (LFC) problem makes it difficult to ensure stability for all operating points when an integral or a PI controller is used [2].

In order to improve the dynamic performance, an intelligent controller for the LFC problem is developed and applied in connection with the power system under study [2]. A Fuzzy Frequency Controller (FFC) is designed and implemented to improve the dynamic performance of the system. A typical single-area power system is considered as a test network and simulation results are presented and discussed.